

Work Order ID 132988

Thursday, May 21, 2015 7:18:31 AM

132988

Page 1

Item ID: D412-664-443TRN

Accept

N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Turning Detail

Stop

NS2

Start Date: 5/21/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 5/21/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan: MCS

Date: MAY 21 2015

Tooling:

Date:

Run

Start

NR1

QC:

Date:

SPC (Y/N):

Date:

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
D412-664-443	REV A U/R <u>OK</u> <u>9/15/17</u>

100

100

Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

Memo

1-Cut tube on chop saw, leave extra mat'l for facing.
2-Face tube to length.

0.00

0.00

1 φ mm
15/07/13

110

110

QC

Quality Control

QC1- Inspection performed by CMM

Memo

0.00

0.00

1 φ mm
15/07/14

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS <table style="width:100%; border: none;"> <tr> <td style="border: none;">Skid-tube ☐</td> <td style="border: none;">Cross tube ☐</td> <td style="border: none;">Water Jet ☐</td> <td style="border: none;">Engineering ☐</td> </tr> <tr> <td style="border: none;">Machining ☐</td> <td style="border: none;">Small Fab ☐</td> <td style="border: none;">Prod. Eng. Coord. ☐</td> <td style="border: none;">Quality ☐</td> </tr> <tr> <td style="border: none;">Thermoforming ☐</td> <td style="border: none;">Finishing ☐</td> <td style="border: none;">Rec/Store/Packaging ☐</td> <td style="border: none;">Other ☐</td> </tr> <tr> <td style="border: none;">Large Fab ☐</td> <td style="border: none;">Composite ☐</td> <td style="border: none;">Supplier ☐</td> <td></td> </tr> </table>						Skid-tube ☐	Cross tube ☐	Water Jet ☐	Engineering ☐	Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐	Thermoforming ☐	Finishing ☐	Rec/Store/Packaging ☐	Other ☐	Large Fab ☐	Composite ☐	Supplier ☐																																																	
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 Revision ID: Stop ***NS2***
 Item Name: Crosstube Turning Detail
 Start Date: 5/21/2015 Start Qty: 1.00 ***1*** Cust Item ID:
 Required Date: 5/21/2015 Req'd Qty: 1.00 ***1*** Customer:
 Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____ Run Start ***NR1***
 QC: _____ Date: _____ SPC (Y/N): _____ Date: _____ Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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120

120

Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

Memo

1-Fill tube with sand & install plugs on both ends
 2-Turn as per Folio FB216
 3- File transition lines smooth.
 4-Scribe part # as per Dwg D412-664-443
 FOLIO REV: 7/7
 DWG REV: 7

0.00

0.00

130

130

QC

Quality Control

QC1- Inspection performed by CMM

Memo

0.00

0.00

140

140

QC

Quality Control

QC8- Inspect parts - second check

Memo

0.00

0.00

mmml
15/07/15

mmml
15/07/20

15-07-22

DAS
47
9-89

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

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150 *150* Crosstubes Crosstubes	Large Fab Memo Grind machining marks smooth longitude way.	0.00 0.00							
180 *180* QC Quality Control	QC15- Crosstube Dimensional Check Memo N/A	DAS 9 0.00 9-89 0.00							
190 *190* Packaging Packaging	Identify as per dwg & Stock Location: LG003 Packaging Memo LOCATION : LG014	0.00 0.00							

BC 15/09/15

BC 15/09/15

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
Date :	Step #:	QTY Effective :		MRB (QSI042) Approval	
Description Work Order Deviation		Disposition		Completed By	
				Lead hand / Supervisor Approval Verification	
				QC / QA Coordinator Approval	
Root Cause		FAULT CATEGORY			
Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐	No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐	Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐	Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐	Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Mislabeled ☐ Fit/Function ☐ Misaligned/off center ☐	Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐
OTHER : ☐					

Work Order ID 132988

Thursday, May 21, 2015 7:18:31 AM

132988

Page 4

Item ID: D412-664-443TRN

Accept

N900040100Setup Start ***NS1***

Revision ID:

Item Name: Crosstube Turning Detail

Stop ***NS2***Start Date: 5/21/2015 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 5/21/2015 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____
QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start ***NR1***Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
200	QC21- Final Inspection - Work Order Release	0.00							
200									
QC	Memo	0.00							
Quality Control									

ML5 SEP 16 2015

ML5 SEP 16 2015

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
Date :	Step #:	QTY Effective :		MRB (QSI042) Approval	
Description Work Order Deviation		Disposition		Completed By	
				Lead hand / Supervisor Approval Verification	
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Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐ No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐	Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐ Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐ Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐ Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐				
OTHER : ☐					

Picklist Print

Thursday, May 21, 2015 7:18:40 AM

Page 1

Work Order ID: 132988

132988

Parent Item: D412-664-443TRN

D412-664-443TRN

Parent Item Name: Crosstube Turning Detail

Start Date: 5/21/2015

Required Date: 5/21/2015

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP REV:A NEW ISSUE 13-09-26 JLM VERIFIED BY:DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6020-160		Manufactured	No				Each	21.0000		1			
D6020-160									**				
Crosstube Material													

Location

Loc Qty

Loc Code

HALL

21

21

126259

— I name 15/07/13

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS <table style="width:100%; border: none;"> <tr> <td style="border: none;">Skid-tube ☐</td> <td style="border: none;">Cross tube ☐</td> <td style="border: none;">Water Jet ☐</td> <td style="border: none;">Engineering ☐</td> </tr> <tr> <td style="border: none;">Machining ☐</td> <td style="border: none;">Small Fab ☐</td> <td style="border: none;">Prod. Eng. Coord. ☐</td> <td style="border: none;">Quality ☐</td> </tr> <tr> <td style="border: none;">Thermoforming ☐</td> <td style="border: none;">Finishing ☐</td> <td style="border: none;">Rec/Store/Packaging ☐</td> <td style="border: none;">Other ☐</td> </tr> <tr> <td style="border: none;">Large Fab ☐</td> <td style="border: none;">Composite ☐</td> <td style="border: none;">Supplier ☐</td> <td></td> </tr> </table>						Skid-tube ☐	Cross tube ☐	Water Jet ☐	Engineering ☐	Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐	Thermoforming ☐	Finishing ☐	Rec/Store/Packaging ☐	Other ☐	Large Fab ☐	Composite ☐	Supplier ☐																																																	
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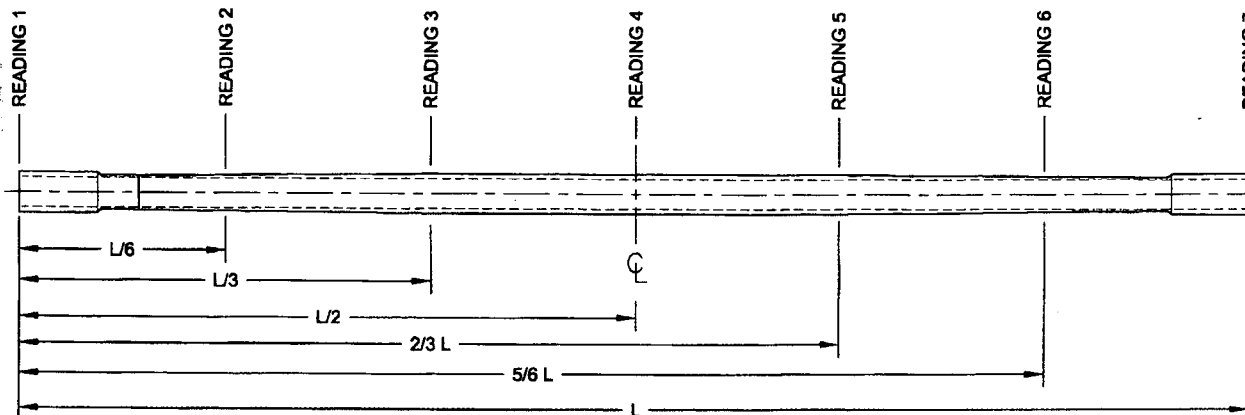
DART AEROSPACE LTD	Work Order: 132988
Description: Crosstube Assembly (412 High Aft SS)	Part Number: D412-664-443
Inspection Dwg: D412-664-443 Rev: A	Page 1 of 2

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.776	+0.005/-0.000	2.781	✓		vern	CNC-08
	2.776	+0.005/-0.000	2.780	✓		↓	
	2.880	+0.005/-0.000	2.884	✓		↓	
	2.990	+0.005/-0.000	2.992	✓		↓	
	3.100	+0.005/-0.000	3.103	✓		↓	
	3.250	+0.005/-0.000	3.253	✓		↓	
						vern	
	7.980	+/-0.060	8.00	✓		vern	CNC-05
	0.063	+/-0.010	.063	✓		RG	
	0.500	+/-0.010	.500	✓		"	
	2.990	+0.005/-0.000	2.994	✓		vern	CNC-08
SIDE B	2.776	+0.005/-0.000	2.779	✓		vern	CNC-08
	2.776	+0.005/-0.000	2.779	✓		↓	
	2.880	+0.005/-0.000	2.884	✓		↓	
	2.990	+0.005/-0.000	2.993	✓		↓	
	3.100	+0.005/-0.000	3.104	✓		↓	
	3.250	+0.005/-0.000	3.253	✓		↓	
	7.98	+/-0.060	8.00	✓		vern	CNC-05
	R0.06	+/-0.010	.063	✓		RG	
	R0.50	+/-0.010	.500	✓		"	
	Ø2.990	+0.005/-0.000	2.993	✓		vern	CNC-08
	130.10	+/-0.060	130.10	✓		tape	66-11

DART AEROSPACE LTD	Work Order: 132988
Description: Crosstube Assembly (412 High Aft SS)	Part Number: D412-664-443
Inspection Dwg: D412-664-443 Rev: A	Page 2 of 2

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.311	.309	.314	.318	.009	0.073"
READING 2 L= 22	.206	.198	.211	.217	.020	
READING 3 L= 43	.317	.313	.322	.325	.012	
READING 4 L= 65	.438	.440	.442	.440	.004	
READING 5 L= 87	.325	.336	.313	.310	.020	
READING 6 L= 108	.203	.262	.217	.216	.015	
READING 7 L= 130	.315	.312	.315	.321	.009	

Calibration Result

Actual Block Thickness: 100 .500

DAS

Sitscan 250 Measured Thickness: 100 .500

Measured by: <u>mmL</u>	Audited by: <u>47</u>	Preliminary Approval:
Date: <u>15/07/20</u>	Date: <u>15-07-22</u>	Date:

Rev	Date	Change	Revised by	Approved
A	14.06.24	New Issue (P/O D412-664-403)	KJ	<u>[Signature]</u>

Item	Qty -443	Part Number	Description
1	X	D412-664-443	CROSSTUBE ASSEMBLY (412 HI AFT)
2	1	D6020-132	CROSSTUBE MATERIAL (132" MIN. LENGTH)
3	2	D3595-063-530	RUBBER CUSHION
4	1	D4909-1	SUPPORT
5	2	D4910-1	CHAFING SHIELD
7	4	MS21920-26	CLAMP
8	2	MS21920-28	CLAMP
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD
10	A/R	PROSEAL 890	SEALANT

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6020-132
FINISHED LENGTH = 130.10±0.060 (BEFORE BENDING/TRIMMING)
 - 2) FINISH: PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (ZN C6-2, HATCHED AREA)
PAINT OUTSIDE PER DART QSI 005 4.2
AFTER PAINTING, REMOVE MASKING AND APPLY MATTE CLEAR COAT PER DART QSI 005 4.2
 - 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
 - 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
 - 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
 - 6) IDENTIFICATION: SCRIBE DART P/N "D412-664-443" AND B/N ON INSIDE OF CUFF PER DART QSI 044 6.4 (VIBRATING STYLUS)
 - 7) WEIGHT: 90.2 lb AFTER MACHINING
88.7 lb FINISHED WEIGHT
 - 8) PART IS SYMMETRIC ABOUT CENTERLINE.
 - 9) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- BENDING**
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 7% (BASED ON O.D.) IN LOWER HALF OF R35 BEND AND 6% (BASED ON O.D.) ON REMAINING TUBE.
 - 11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038. TO BE PERFORMED AFTER FINAL POST-BEND GRINDING. ANY ADDITIONAL GRINDING REQUIRES ANOTHER LPI INSPECTION.

ASSEMBLY

- 12) INSTALL D4909-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015.
- 13) INSTALL MS21920-28 CLAMPS WITH D3595-063-530 RUBBER CUSHIONS TO SECURE THE D4909-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE ON TOP OF CROSSTUBE SUPPORT.
- 14) IF NOT ALREADY PRESENT ON CHAFING SHIELD, APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D4910-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEALD D4910-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- 15) TORQUE CLAMPS ON D4909-1 SUPPORT 80 TO 100 IN-LB. TORQUE CLAMPS ON D4910-1 CHAFING SHIELD 40 TO 50 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVES HAVE CURED FOR 24 HOURS.

17-CC

17-CC

17-CC

NO. 132988 MJS
15-05-21

UNDER REVIEW

4/15/14

URF 15-561

UNDER REVIEW

4/17/14

URF 15-561

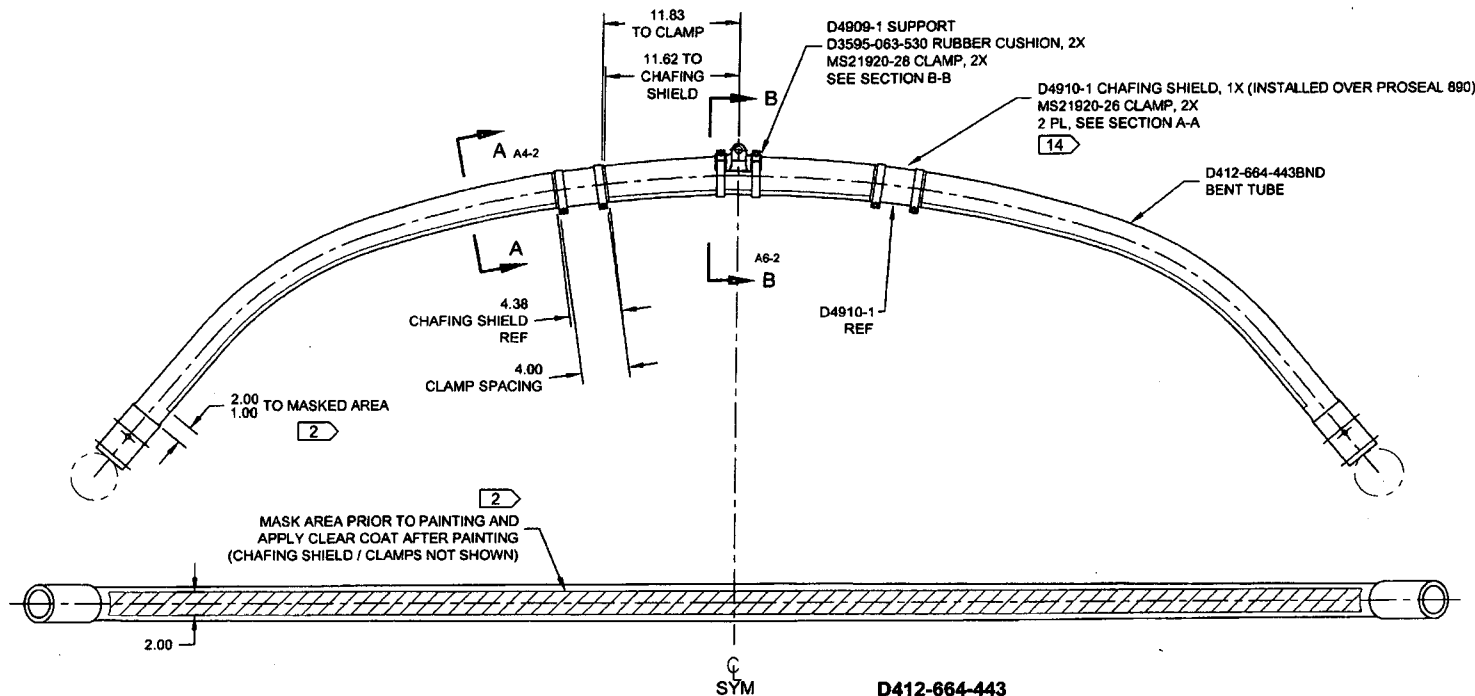
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2014-05-26

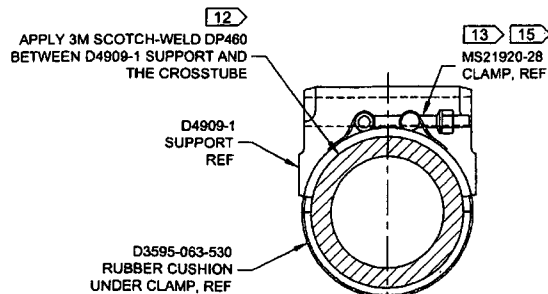
WPD

A	NEW ISSUE	CP	14.04.01
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	14.04.01		

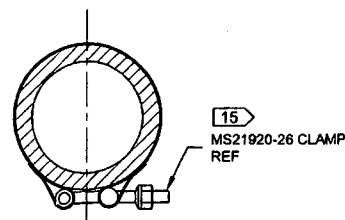
DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D412-664-443	REV. A SHEET 1 OF 4
TITLE CROSSTUBE ASSY (412 HI AFT)	SCALE NTS
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D412-664-443
ASSEMBLY DETAIL



SECTION B-B D4-2
SCALE 4X



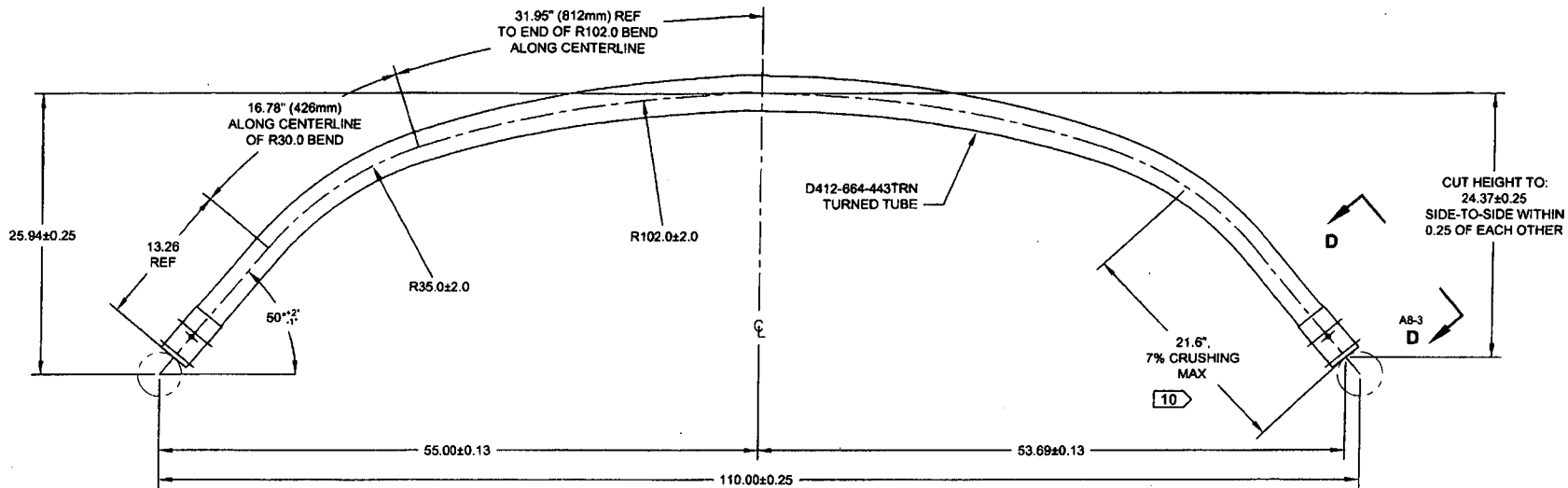
SECTION A-A C6-2
SCALE 4X

UNDER REVIEW
15/14/23

UNDER REVIEW
15/14/23

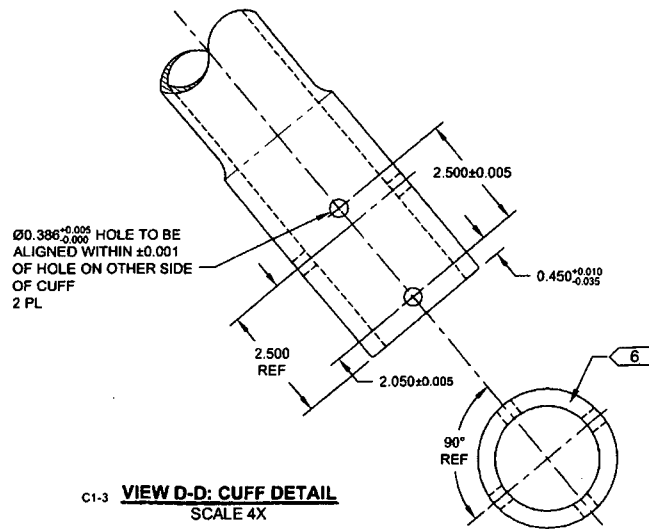
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DESIGN	9P	DART AEROSPACE LTD	
DRAWN	9P	HAWKESBURY, ONTARIO, CANADA	
CHECKED	DW	DRAWING NO.	REV. A
MFG. APPR.		D412-664-443	SHEET 2 OF 4
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D412-664-443BND
BENDING DETAIL

10



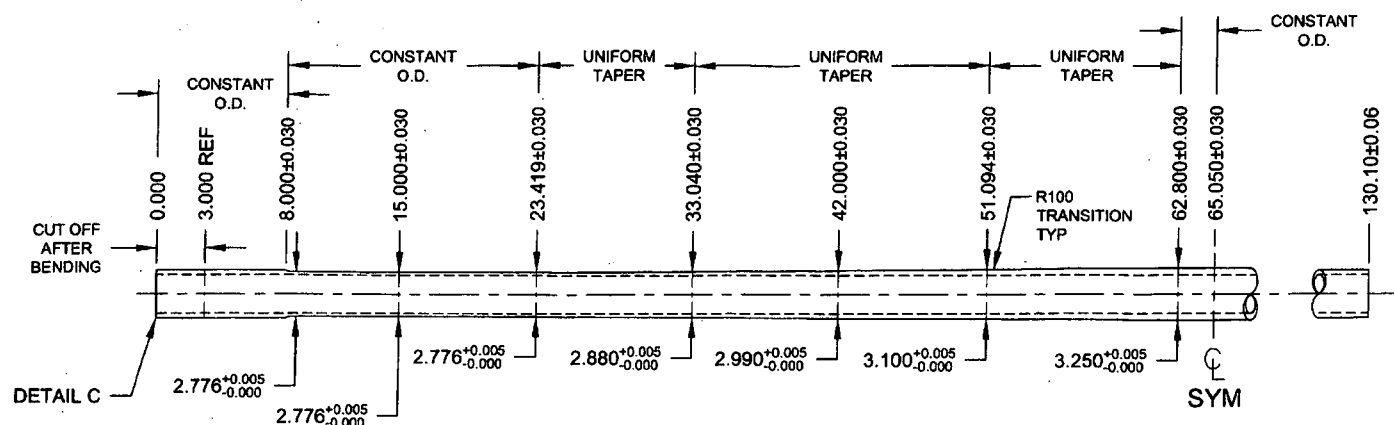
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SCALE 4X

OK
P. 14/14
UNDER REVIEW
14/7/24

UNDER REVIEW
P. 15/14/24

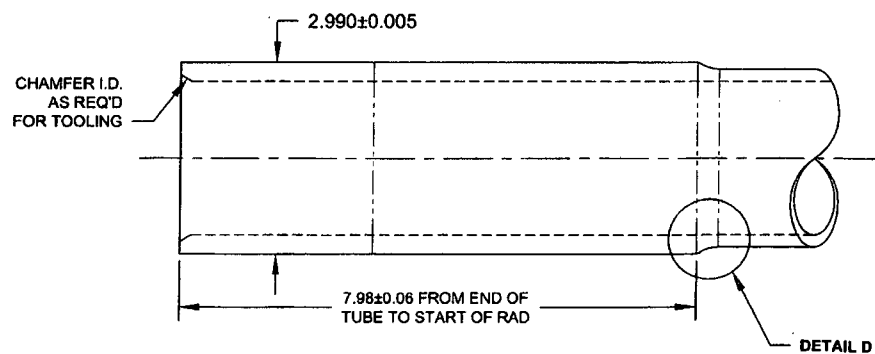
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MFG. APPR.		D412-664-443	SHEET 3 OF 4
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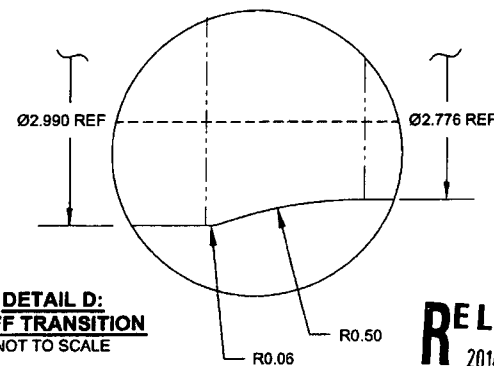


D412-664-443TRN
TURNING DETAIL

UNDER REVIEW
UP 15/14/28



DETAIL C:
CUFF TRANSITION
SCALE 4X



DETAIL D:
CUFF TRANSITION
NOT TO SCALE

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2014-05-26

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MFG. APPR.		D412-664-443	SHEET 4 OF 4
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